Australian Mining

_Policy priorities to capitalise on the big data, high tech era of Australian mining

THE NEXT FRONTIER

Australian Mining POLICY PRIORITIES

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Warning Please be aware that this publication may contain the names or images of Aboriginal and/or Torres Strait Islander people who may now be deceased.

The Minerals Council of Australia is the peak national body representing Australia's exploration, mining and minerals processing industry, nationally and internationally, in its contribution to sustainable economic and social development. This publication is part of the overall program of the MCA, as endorsed by its Board of Directors, but does not necessarily reflect the views of individual members of the board.

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February 2019.

_Australia's resources industry has the unique characteristic of being both the nation's oldest export industry as well as its most modern one.

Today, on the back of two decades of visionary, record investment, resources earns more export income for Australia than all other industries combined, generating a record $221 billion in 2017-18. Employment has more than doubled and average wages are the highest of any sector.

Having built this industry, now is the time for the nation to make the best of the opportunity.

Australia's comparative advantage in resources exports is not simply a matter of good fortune; nor is it easily won. It comes from the skilled, creative and innovative combination of people and technology transforming natural endowments into valuable exports.

To remain competitive against increasingly sophisticated rivals, the industry must improve productivity. That is why the skills, diversity and flexibility of the future workforce are so important.

Australian mining is a global technology leader and there is an increasing role for automation, data analytics, mechatronics, robotics and artificial intelligence that will see Australian mining continue to be at the forefront of innovation.

But these tools are nothing without people.

Mining employs a broad range of scientific fields, professional occupations and trades. The challenge now is to identify the new skills that will sustain the existing workforce and the right policy settings to provide new opportunities for more Australians.

The Next Frontier outlines the industry's economic, environmental and social performance strengths and the policy changes that are part of the shared mining challenge.

Tania Constable
Chief Executive Officer
Minerals Council of Australia

THE NEXT FRONTIER

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LOOK FOR THIS SYMBOL

To learn more about how big data and high tech is changing the way Australia mines

ECONOMIC CONTRIBUTION

Australia's resources sector is a major contributor to the national economy and has underpinned the rise in incomes, living standards and prosperity over decades. It is the nation's largest export earner, provides high-paid jobs for hundreds of thousands of people and pays billions of dollars to governments each year in taxes and royalties.

240k
Resources workforce
Nationwide in 2017-18.

$140k
Average annual earnings
In 2017-18.

64%▲
Above average earnings
In 2017-18.

$221b
Resources exports
In 2017-18.

55%
Share of total exports
In 2017-18.

$1.9b
Exploration expenditure
In 2017-18.

Sources: ABS; State treasuries; Western Australia Department of Mines, Industry Regulation and Safety; MCA calculations

The NT's Gulkula bauxite operation is Australia's first Indigenous-owned mine

Northern Territory

Resources jobs	4,681
Economic value	$3.2 b
Share of economy	12.2%
Royalties	$341 m
Exploration	$109 m

Western Australia

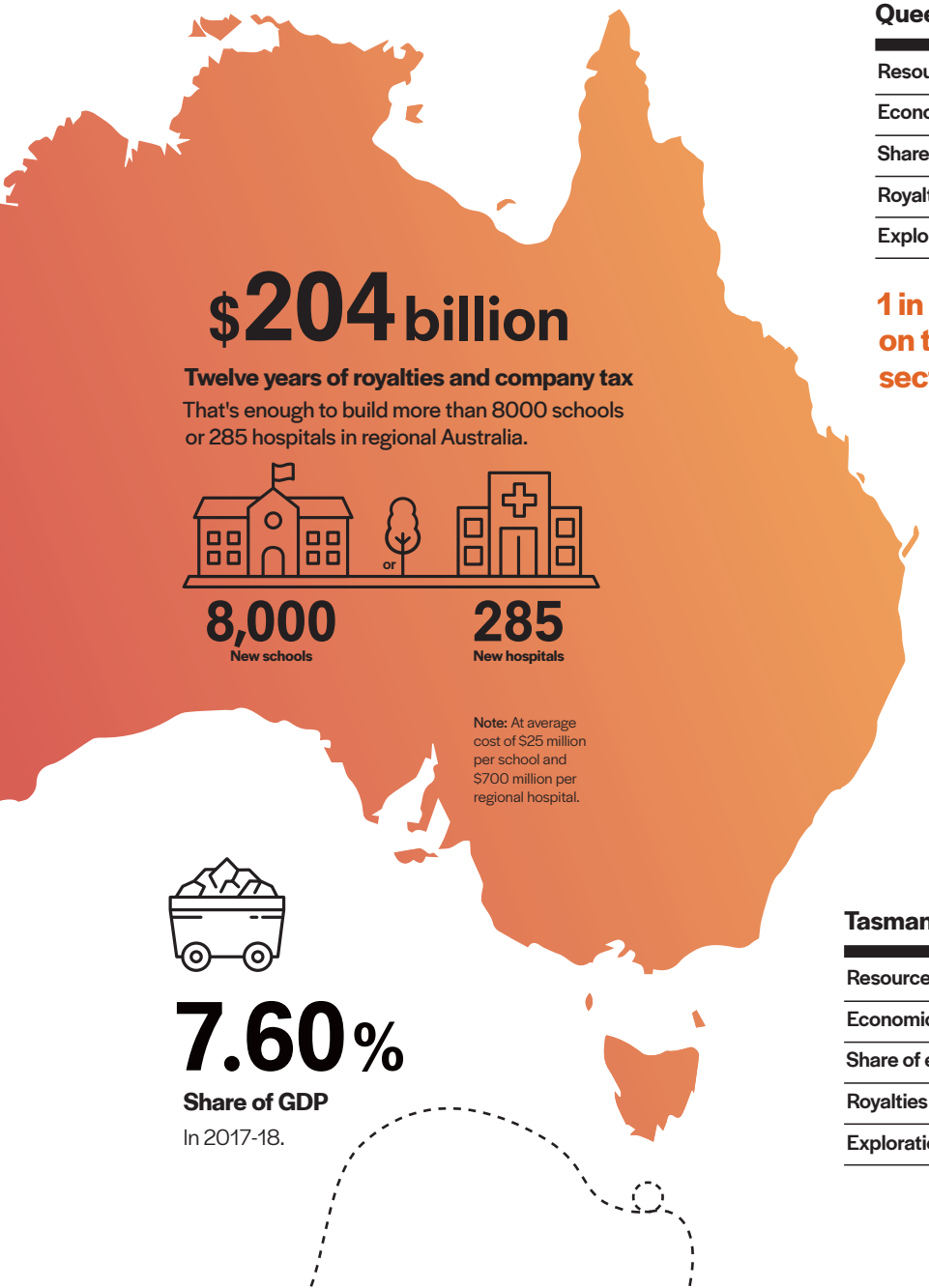
Resources jobs	103,897
Economic value	$76.7 b
Share of economy	30%
Royalties	$5.2 b
Exploration	$1.2 b

WA supplies around half the world's lithium

South Australia

Resources jobs	9,714
Economic value	$3.8 b
Share of economy	3.6%
Royalties	$237 m
Exploration	$55 m

SA has a quarter of the world's known uranium resources



$204 billion

Twelve years of royalties and company tax

That's enough to build more than 8000 schools or 285 hospitals in regional Australia.

8,000
New schools

285
New hospitals

Note: At average cost of $25 million per school and $700 million per regional hospital.

7.60%

Share of GDP

In 2017-18.

Queensland

Resources jobs	66,217
Economic value	$32.1 b
Share of economy	9.5%
Royalties	$4.5 b
Exploration	$280 m

1 in 8 QLD jobs rely on the resources sector

New South Wales

Resources jobs	40,683
Economic value	$17.8 b
Share of economy	3%
Royalties	$1.8 b
Exploration	$229 m

Newcastle is the world's largest coal export port

Victoria

Resources jobs	11,968
Economic value	$3.3 b
Share of economy	0.8%
Royalties	$101 m
Exploration	$74 m

Victoria has the only antimony mine in the country

$591b

Capital expenditure

Ten years to 2017-18.

$204b

Company tax and royalties

Twelve years to 2016-17.

Tasmania

Resources jobs	3,587
Economic value	$1.2 b
Share of economy	4%
Royalties	$37 m
Exploration	$26 m

Tasmania is the largest tin producer in Australia

Mining is 3.7% of the nation's net water use

SOCIAL PERFORMANCE

Mining delivers high-paid jobs for thousands of Australians living in regional areas, supports a large supply chain of small to medium businesses and provides valuable assistance for community groups.

Economic development

Mining companies paid $204 billion in the 12 years to 2016-17 in taxes and royalties, funding schools, hospitals and infrastructure across Australia. Mining companies also voluntarily provide funding to support community programs.

Partnering with communities

The Australian minerals industry joins with host communities to support economic development and is finding new ways to ensure that this shared effort supports local values and long-term community resilience. This contribution extends beyond the mine, as skills and experience at work are transferable to other parts of the community.

Creating local jobs

Mining generates jobs in rural and regional communities. The Productivity Commission has found regions whose economic base is large-scale mining have generally had the highest rates of growth in employment since 2005 and that the average personal income is 'generally higher in mining-intensive regions than in other parts of the country'.

Importance of mining in Australia

Source: CSIRO, *Australian attitudes towards mining*, 2017

'Most Australians accept mining and hold positive views about its role in contributing to the nation's economy.'

CSIRO_*Australian attitudes towards mining*, 2017

Courtesy of Rio Tinto

Investing in communities
Rio Tinto Naturescape Kings Park in Perth has welcomed half a million visitors, including thousands of school groups, since its launch in 2011. The park replicates the experience of playing in the Australian bush in the middle of a thriving city and is celebrated for its success reconnecting children to the natural world. Children are encouraged to problem solve and get creative building dams, climbing rocks, traversing aerial walkways and rope courses.

81.7%

Of people agree...

Mining creates jobs for Australians.

Source: CSIRO, 2017

59.5%

Of people agree...

Mining has positive effects on regional communities.

Source: CSIRO, 2017

63.4%

Of people agree...

Mining has helped improve regional transport infrastructure.

Source: CSIRO, 2017

$6.9b

Supporting regions

Royalties invested in regional Western Australia since 2008.

Source: Government of Western Australia

POLICY PRIORITIES

- **More equitable re-investment of royalties and taxes paid by the mining industry into the revenue-producing regions**
- **Support the Council of Australian Governments' agenda to raise community awareness of the benefits of mining and effective regulation.**

ENVIRONMENTAL STEWARDSHIP

Australia's mining industry is a high value, low volume water user. It is committed to land use co-existence, progressive rehabilitation and supporting alternative post-mining uses, including agriculture and conservation.

Low water user

Australian mining is a global leader in water management. Mining operations seek to use low quality water not suitable for other purposes, and water is used and reused many times across operations. The industry has developed a water accounting framework that is used around the globe.

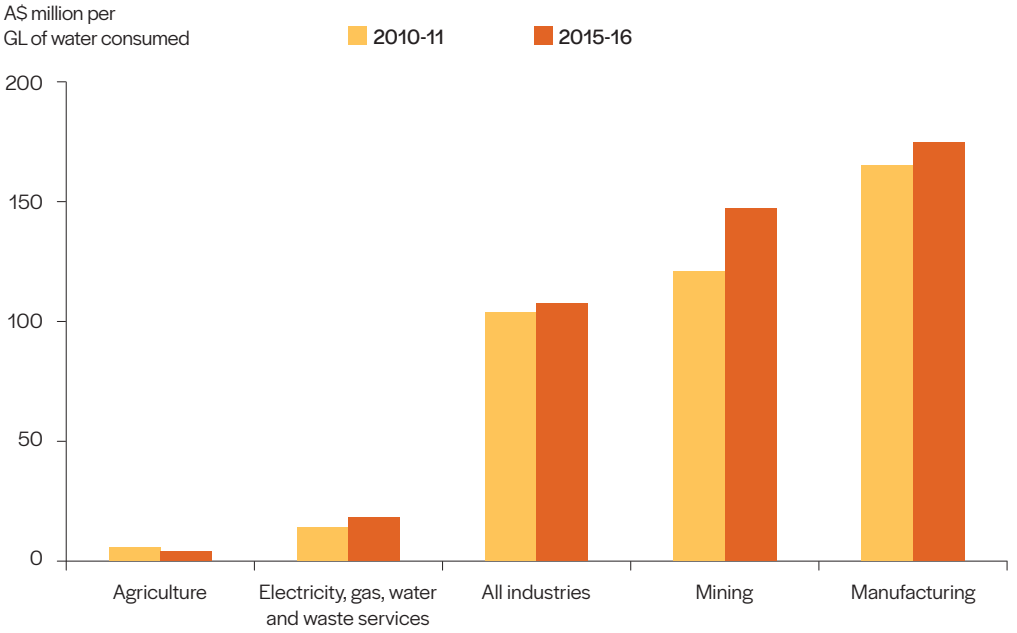
Biodiversity

Preserving biodiversity is a key priority in the planning, operation and closure of every mining project. The industry has contributed to the recovery of threatened species and provides extensive data and resources to national biodiversity research.

Rehabilitation

Planning and preparation for rehabilitation starts at the very beginning of modern mine development. During mine design and operation, mining companies incorporate regional environmental values and community preferences when preparing for the future.

Mining has achieved the greatest rise in value for water use



Source: ABS Cat. no. 4610

<0.1%

Land disturbed

Australian land mass temporarily disturbed by mining activities.

Source: Department of the Environment and Energy

0.7%

Mining leases

Proportion of Australia's land mass under a mining lease.

Source: SNL Metals & Mining

3.7%

Water consumption

Net water consumption by the mining industry in 2015-16.

Source: ABS Cat. no. 4610

$148m

Value added per gigalitre

Value added by the sector per gigalitre of water consumed.

Source: ABS Cat. no. 4610

POLICY PRIORITIES

- **Clear and consistent obligations around biodiversity offsets and rehabilitation, recognising mining's strong track record of stewardship**
- **Remove the duplicative water trigger for coal seam gas and large coal developments**
- **Embed the COAG Multiple Land Use Framework, acknowledging the benefit for all of resource development alongside landholder interests.**

DRONE PILOTS

Drone-based surveillance systems are routinely used for mine maintenance, monitoring and exploration. Some drones can even deliver samples from site. Equipped with advanced cameras that capture real-time aerial footage and 3D maps, drones are safer, faster and more cost effective than conducting monitoring or surveying work by piloted plane. Drone pilots are among the growing number of specialised, high tech roles being created across the industry.

STREAMLINED ENVIRONMENTAL REGULATION

Australia's complex and duplicative project assessment and approval processes generate unnecessary delays and uncertainty, presenting a barrier to attracting investment.

Reduce delays

Overlapping state and federal approval processes delay development with no added benefit to the environment. A 2014 BAEconomics study found reducing project delays by one year would improve the competitiveness of Australia's mining sector, add $160 billion to national output by 2025 and create an extra 69,000 jobs across the economy.

Appeal mechanisms

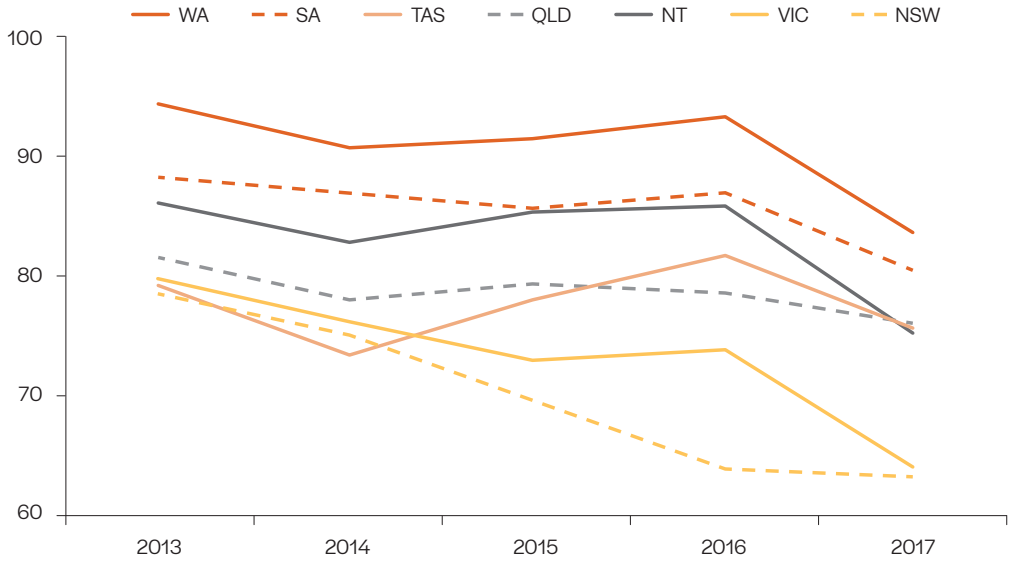
Appeal mechanisms are important but are being misused by activists to deliberately halt or delay projects, with new projects now taking on average three times as long to develop. While largely unsuccessful, the cost to proponents and people in the regions is significant with no environmental benefit.

EPBC Act triggers

Unnecessary Environment Protection and Biodiversity Conservation (EPBC) Act triggers for water and uranium mining wholly duplicate state assessment and approvals and should be reformed.

Industry leaders' perceptions of government policies are on the decline

Fraser Institute Policy Perception Index



Source: Fraser Institute, *Survey of Mining Companies 2017*

Courtesy of Glencore

New standards in rehabilitation
Glencore is pioneering the use of natural landform rehabilitation at its Mangoola open cut coal mine in the Hunter Valley. Believed to be the largest project of its type in the region, 1,300 hectares of mined land is being returned to natural landform. Expected environmental benefits include increased biodiversity for plant vegetation and native fauna, improved water quality and reduced erosion potential. Glencore rehabilitated 70 per cent of its mined land between 2013 and 2017.

$240m

Regulatory cost
Cost of unnecessary regulatory burden to major projects.
Source: Productivity Commission

2yrs

Projects delays
Court challenges can delay coal projects for more than two years.
Source: Productivity Commission

10-13%

One year delay cost
The impact of a one year delay on project net present value.
Source: MCA estimates

$47m

Cost to business
Annual cost imposed by the EPBC Act water trigger.
Source: Commonwealth of Australia

POLICY PRIORITIES

- **Maintain the EPBC Act's objective to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources**
- **End the duplication and overlap between respective state and federal processes and introduce risk-based assessment approaches**
- **Implement reforms to prevent frivolous and vexatious legal challenges to approved projects.**

HEALTH AND SAFETY

The minerals industry's number one value and commitment is the safety and health of its workforce, where everyone who goes to work in the industry returns home safe and healthy.

A safe workplace is industry's most important task.

Workplace safety

Australia's minerals industry is firmly committed to the principle that every individual, whether as a direct employee or contractor, should have the same high standard of workplace safety. The industry has set itself the goal of becoming free of fatalities.

Consistent regulatory system

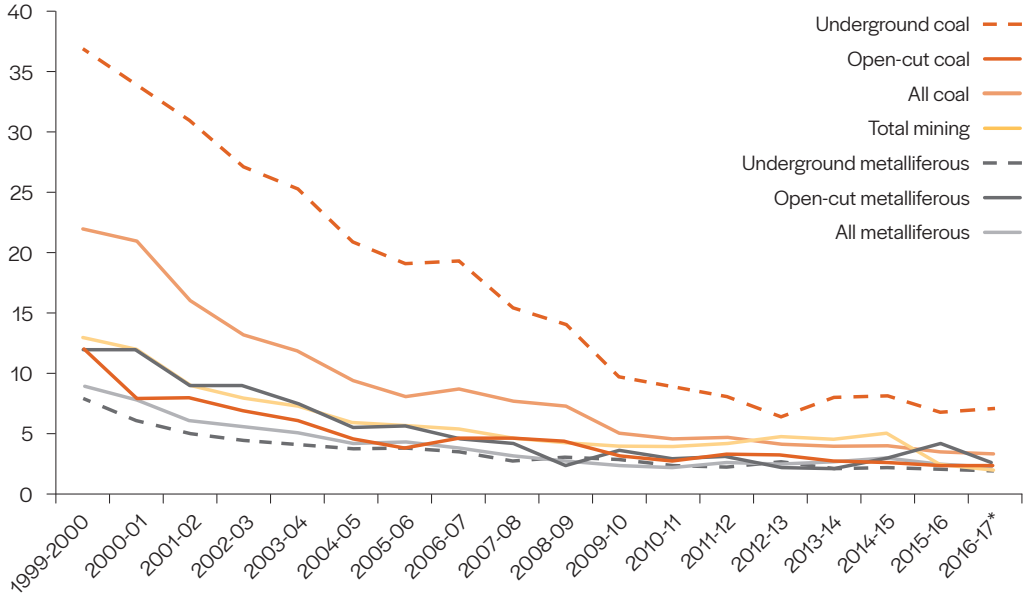
A nationally consistent, risk-based preventative work health and safety regulatory system, supported by industry-specific regulation, would deliver greater certainty, consistency and efficiency. It would also help to ensure compliance challenges do not detract from the practical tasks of identifying, managing and minimising risk and the continuous improvement of safety and health outcomes by companies.

Mental health

The MCA's *Blueprint for Mental Health and Wellbeing* is another signature industry initiative that provides a framework to promote wellbeing, as well as reduce the risks and impacts of mental illness.

Rate of mining injuries have fallen since 2000

Lost time injury frequency rate per million hours worked



Source: Professor David Cliff, Sustainable Minerals Institute, University of Queensland

* 2016-17 Queensland and Western Australia data only

Emergency response competitions
The Victorian Mine Rescue Competition (pictured) and the Northern Australian Emergency Response Competition pit mine rescue teams from across the country against each other in simulated emergencies. Judged by professional adjudicators, teams respond to 'incidents' that test skills fighting fires, applying first aid, conducting search and rescue operations, safely handling hazardous materials and responding to road accident rescues.

POLICY PRIORITIES

- **A nationally consistent, risk-based preventative work health and safety system, supported by industry-specific regulation**
- **Timely access to government-held health and safety data to better inform operational health and safety improvement initiatives**
- **The industry does not support the introduction of industrial manslaughter offences into the model work health and safety laws as these are inconsistent with accepted principles of criminal law.**

ZERO

Industry goal

For fatalities, injuries and diseases across the sector.

Source: MCA

33%

Reduction in injuries

And mining-related illnesses between 2013-14 to 2017-18.

Source: ABS Cat. no. 6324

>$450m

Annual mental health cost

Annual cost to the NSW mining industry from mental health issues.

Source: NSW Minerals Council

16 to 2

Decline in fatalities

Steady decline in mining-related fatalities from 2013-14 to 2017-18.

Source: MCA

INDIGENOUS PARTNERSHIPS

The minerals industry is one of the largest private sector employers of Indigenous Australians and a significant investor in Indigenous economic development.

Recognition

More than 60 per cent of minerals operations are near Indigenous communities and much of the land that the industry operates on is under native title. Aboriginal and Torres Strait Islanders are the first peoples of this nation and this guides the Australian minerals industry's partnerships with Indigenous communities.

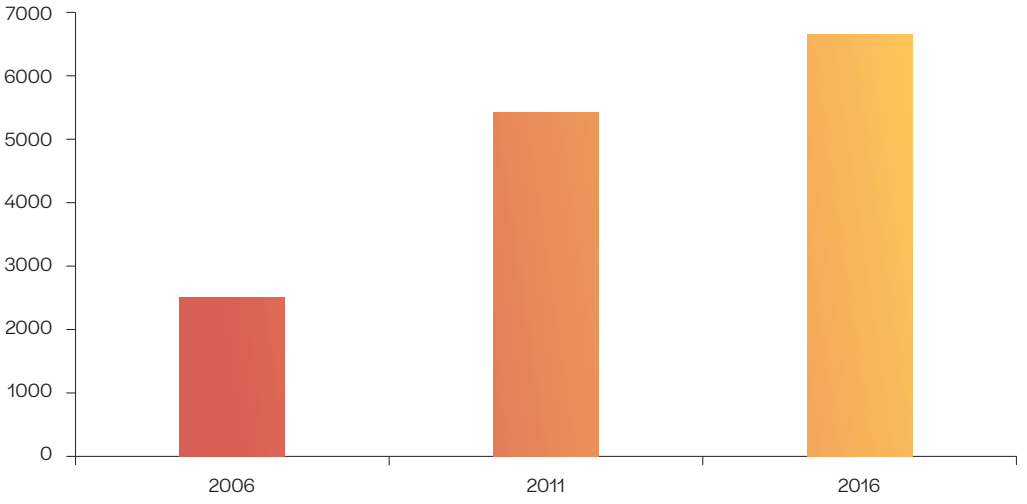
Economic opportunities

These partnerships have helped unlock unprecedented business, training and employment opportunities for Indigenous communities. Indigenous mining jobs have grown 150 per cent since 2006. Nearly 20 per cent of Indigenous mining employees are women.

Strengthening the partnership

Entrepreneurial Indigenous businesses have established themselves as a critical part of the mining supply chain and provide opportunities broader than a single project, adding to the sustainability of communities. Around 1,900 land use agreements have been established over the last two decades, of which 99 per cent involved no legal contest.

Indigenous mining workforce has increased 150 per cent since 2006



Source: ABS, Census 2006, 2011, 2016

'The positive approach by minerals companies toward their relationships with Indigenous communities has fostered respect for Aboriginal culture and history and delivered tangible socio-economic impacts.'

Professor Marcia Langton AM_University of Melbourne

Courtesy of Newcrest

Working together at Telfer
Newcrest's Telfer mine has a 40-year history of engagement with the Martu people, the Traditional Owners of land surrounding its mine in the Pilbara. It consolidated the partnership with an Indigenous Land Use Agreement (ILUA) in December 2015. Newcrest has employed more than 500 Martu men and women over the past 15 years and continues to deliver employment, training, contracting and community programs in partnership with the Martu.

POLICY PRIORITIES

- **Maintain the successful framework of the Native Title Act while allowing operational reforms to improve outcomes for traditional owners and industry**
- **A new economic vehicle, involving prescribed body corporates, to enhance native title benefits for Traditional Owners from mining and other economic activities**
- **Continued investment in Indigenous-led economic development programs, including the Indigenous Advancement Strategy and PBC capacity building.**

150%

Indigenous job growth

Growth in Indigenous mining employment since 2006.

Source: ABS Census 2006, 2016

>1,900

Land use agreements

Indigenous LUAs established with the mining industry over the past two decades.

Source: Prof. Marcia Langton AM

6,652

Indigenous employment

Direct employment in 2016. That's around 3.7 per cent of the mining workforce.

Source: ABS Census 2016

19%

Female employment

In 2016, 19 per cent of Indigenous mining workers were women.

Source: ABS Census 2016

FUTURE WORKFORCE

Mining's high wages reflect the high skill levels of the workforce and the innovative technologies increasingly used by the workforce.

Preparing for change

The industry has an opportunity to recast itself as an exciting and vibrant industry with diverse jobs and opportunities to attract a wide array of talent, including young Australians, and give new opportunities for the existing workforce to upskill and take on new roles.

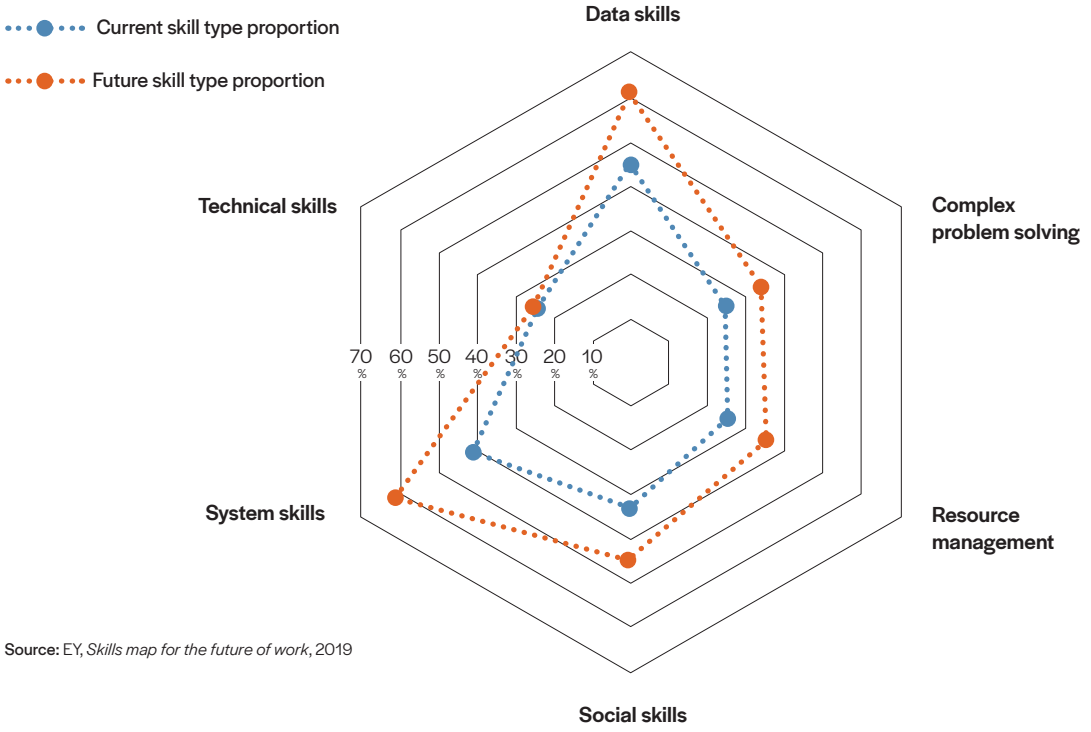
Future workforce

Mining innovation is driving new specialist occupations, such as data scientists and mechatronic engineers. Traditional jobs are increasingly being augmented with new technology – for example, traditional surveying using drone technologies – and the industry is responding by up-skilling its employees. The composition of the current and future minerals workforce will continue to evolve with the increasing need for skills in data analytics, robotics and artificial intelligence.

Manufacturing and services

The rapid changes in technology are giving new opportunities to partners in the mining, equipment and technology services sector and related industries, which along with mining, employ more than a million people directly and indirectly across Australia.

Mining skills of the future are broader and more sophisticated



Source: EY, *Skills map for the future of work*, 2019

Courtesy of BHP

13,169

Mining patents

Patents filed related to mining between 2005 and 2017.

Source: IP Australia

1.1m

METS and mining jobs

Direct and indirect mining and METS jobs in 2015-16.

Source: Deloitte Access Economics

$236b

Economic contribution

Mining and METS direct and indirect benefit in 2015-16.

Source: Deloitte Access Economics

$1.9b

Mining R&D spend

Mining industry expenditure on R&D in 2015-16.

Source: ABS Cat. no. 8104

POLICY PRIORITIES

- **Modernise tertiary and vocational courses, content and delivery to provide the knowledge and skills needed in the redesigned workplaces of the future**
- **Seek a market-responsive temporary skilled migration scheme for specialist skills related to industry technology adoption**
- **Create partnerships between high tech METS sector and mining firms.**

REMOTE OPERATIONS

Remote operations centres are the central data hubs of modern mining. Data capture sensors, closed-circuit cameras, equipment performance logs and telecommunications are part of a complex network feeding real-time data to mine workers in air conditioned offices sometimes 1,500 kilometres away. Remote functions can include truck dispatch, drill control, locomotive and port management. This enables mine managers to identify efficiencies and make informed decisions about fleet management, for example, or workforce wellbeing.

SKILLS AND TRAINING

Australia's competitive advantage in mining is its highly-skilled workforce. Innovation and investment in training drives high-value, high-wage jobs in scientific and highly skilled professional occupations.

The minerals industry is changing with rates of technology adoption across the sector reshaping the skills required by the current and future workforce.

Specialist skills

Specialist skills are required to unlock new resources, boost productivity, protect the environment, enhance worker safety and generate value for the wider community. Enrolments in the key discipline of mining engineering are not keeping pace, requiring new focus and effort from industry, government and the education sector.

Future workforce training

The future minerals workforce will be diverse, distributed and connected and require broad ranging skills using both accredited and non-accredited training. Industry will need to work closely with government to ensure that accredited training is responsive to industry needs.

Vibrant regions

A commitment to local training further delivers the benefits of mining to regional areas. This is complemented by the use of strategies such fly-in, fly-out (FIFO) and drive-in, drive-out (DIDO) arrangements to maximise the benefits for all.

High skilled occupations in the mining sector	Directly employed	Indirectly employed	Industry rank*
Chemical and material engineers	722	1,230	3
Environmental scientists	1,968	7,977	3
Geologists and geophysicists	4,773	2,390	1
Industrial and mechanical engineers	2,372	7,823	3
Metallurgists and physicists	900	1,638	1
Mining engineers	8,019	2057	1
Mining production managers	7,424	–	1
Surveyors and spatial scientists	866	–	5

Source: Department of Employment, Job Outlook 2017; MCA calculations

* rank by main employing industries

'Our industry is in a sustained period of change, bringing with it an exciting era of disruption. This convergence of market forces, social trends and demographic shifts is reshaping how we work, and the skills and capabilities required for our future.'

Nicky Firth_VP Human Resources, Rio Tinto Iron Ore 17 May 2018

Courtesy of UNSW

Virtual reality mining at UNSW
A state-of-the-art Virtual Reality (VR) Suite is immersing students into a new world of experiential learning at the University of New South Wales School of Mining Engineering. Developed in conjunction with industry partners, the VR Suite casts 360-degree 3D images of above and below ground mining operations on a dome-shaped stage with cinematic clarity. Mining engineering students are gaining industrial training through virtual mine visits far beyond what a textbook can offer.

POLICY PRIORITIES

- **Funding adjustments for minerals disciplines i.e. mining engineering to ensure teaching capacity is maintained in Australia**
- **An industry-led, demand-driven, responsive vocational education and training system to cater for the emerging skills of the future**
- **Funding of training should extend to particular or unique skills or abilities, not just qualifications.**

22%

University educated

A further 38 per cent hold a certificate III or IV; another 8 per cent hold a diploma.

Source: ABS, Census 2016

4%

Apprentices & trainees

Comprise 4 per cent of the mining workforce, which is double the national average.

Source: National Centre for Vocational Education Research

<50

Engineering enrolments

Mining engineering enrolments in Australia in 2018, down from over 250 in 2012.

Source: Minerals Tertiary Education Council

4,500

Minerals graduates

Benefited from $50 million university funding through MTEC over the last decade.

Source: Minerals Tertiary Education Council

WORKPLACE RELATIONS

Australia needs a modern workplace system that supports productivity growth to generate national wealth and sustain future growth in living standards.

High wage jobs come from productivity not regulation.

Productivity

Mining companies and their workforce have a shared commitment to boosting national prosperity by the continual search for greater productivity. Better use of labour and technology comes from discovering skilled, creative and innovative ways to operate in the workplace.

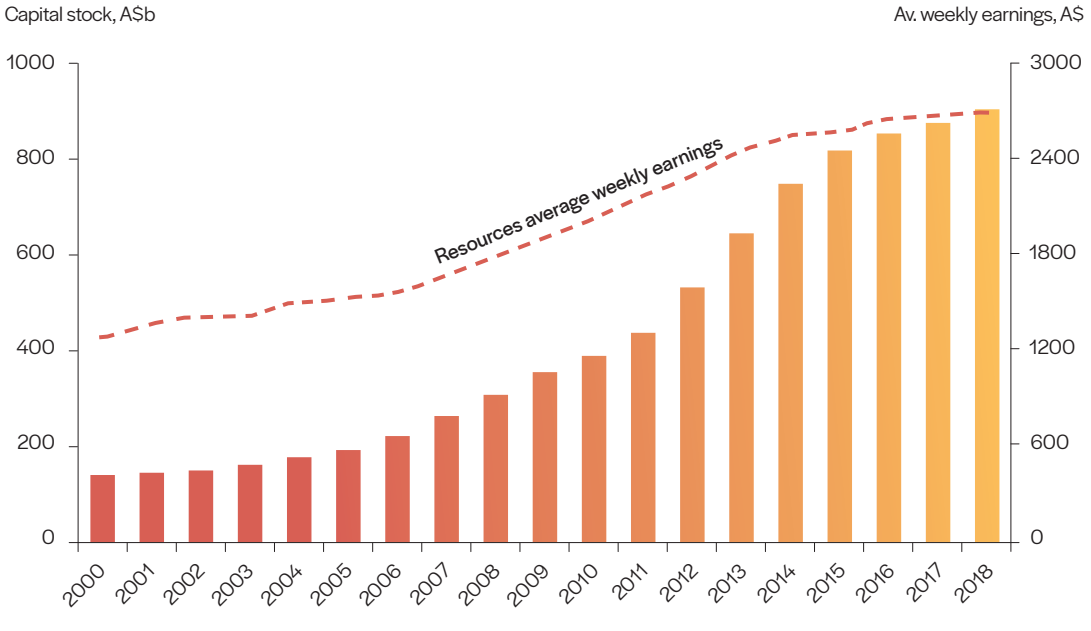
Modern workplaces

The ability to modernise workplaces by maintaining flexibility is vital to the competitiveness of the Australian minerals industry, which is increasingly focused on integrating new technology and ideas into its operations.

Enterprise bargaining

Enterprise bargaining and individual agreements allow for flexible work arrangements that suit the needs of individual businesses and link pay to productivity performance. The resources sector can only pay the highest average earnings in the country because it is one of the most productive industries in the world.

More capital investment leads to higher weekly earnings



Source: ABS Cat. no. 5204; ABS Cat. no. 6302

$140k

Average earnings

Mine workers in 2017-18.

Source: ABS Cat. no. 6302

240k

Direct employment

In the resources sector in 2018.

Source: ABS Cat. no. 6291

84%

Permanent workforce

In the resources sector in 2018.

Source: ABS Cat. no. 6333

$850m

Economic value of reform

Annual boost from workplace relations reform.

Source: Productivity Commission

POLICY PRIORITIES

- **Maintain competitiveness, flexibility and choice in employment arrangements, including the use of labour hire and service contractors**
- **Preserve the productivity gains of enterprise bargaining and resist a return to pattern bargaining or industry-wide bargaining**
- **Confine permitted content – over which protected industrial action can be taken – to direct employment matters.**

BIG DATA FUTURE

Few industries have the breadth or scale required to harness the potential of big data like mining. The mining industry has access to large and complex data sets and increasingly, this data is being used to improve human and autonomous decision making across the supply chain. From real-time planning and fleet management through to shipping logistics and customer patterns, data analysis is driving mining efficiencies, productivity and workplace safety. The industry's investment in data analysis will also increasingly benefit other sectors.

MINERALS EXPLORATION

Exploration is fundamental to the mining industry. Policies that support and incentivise geological mapping and exploration partnerships are crucial to generating the next wave of minerals wealth for the benefit of all Australians.

Entrepreneurial spirit

Minerals exploration represents the best of Australia's entrepreneurial spirit. It is the search for future business opportunities, with no guarantee of success. For mining companies, exploration is analogous to research and development expenditure.

Attracting exploration investment

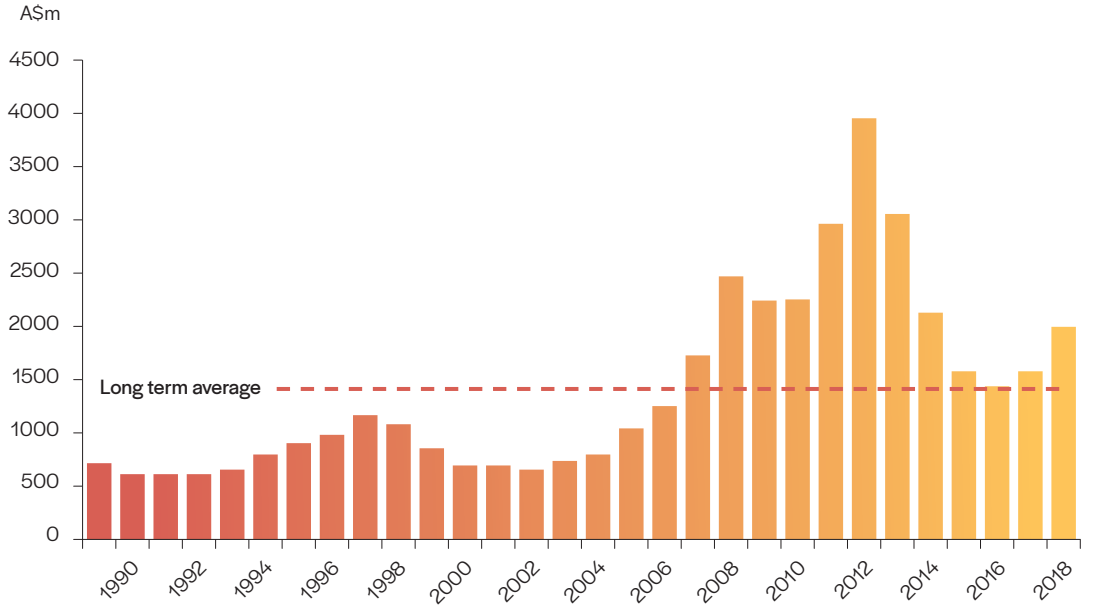
Minerals exploration expenditure was $1.9 billion in 2017-18, an increase of 26 per cent compared to the 12 months prior. Unnecessary regulatory burdens add to the challenge, cost and uncertainty of exploration projects and reduces the attractiveness of Australia among fierce international competition to attract exploration investment.

Big data future

Data science underpins the work of mining engineers, analysts and geologists. But increasingly, big data analysis, as well as developments in artificial intelligence, are also refining the search for undiscovered deposits and providing new prospects in some of the oldest mining regions.

More exploration expenditure is needed to identify the mines of the future

Australian exploration expenditure, by financial year



Source: ABS Cat. no. 8412

Courtesy of Cameco

$1.9b

Exploration investment

In Australia in 2017-18.

Source: ABS Cat. No. 8412

8.9m

Million metres drilled

In Australia in 2017-18.

Source: ABS Cat. no. 8412

13.6%

Non-ferrous exploration spend

World share in 2016-17.

Source: S&P Market Intelligence

2nd

Non-ferrous expenditure

Second highest behind Canada.

Source: S&P Market Intelligence

POLICY PRIORITIES

- **Increase funding for pre-competitive geological survey work which is an important public good**
- **Invest in collaborative industry research programs that develop new exploration technologies**
- **Continue immediate deductibility of exploration expenses as well as the Junior Minerals Exploration Incentive Scheme.**

HI-TECH EXPLORATION

Geospatial data and 3D mapping technology are changing the way mining geologists identify and evaluate deposits beneath the earth's surface. Used in conjunction with historical data sets, more accurate mineral predictions are possible, leading to improved resource identification, better waste classification and greater drilling efficiency. As 'easy' discoveries are exhausted, advanced data analytics and the integration of new and historical datasets will be even more important for companies seeking to optimise exploration processes.

COMPETITIVE TAXATION

A competitive taxation system is critical for investment in capital-intensive, highly prospective and long lead time industries such as the mining industry.

Taxes and royalties

The mining industry is a major taxpayer in Australia. In 2016-17 the industry paid $12.1 billion in company tax, $11.2 billion in royalties and $1.1 billion in payroll taxes to Australian governments. But Australia's effective tax rate is too high for a capital dependent country. Australia has the third highest headline company tax rate among 34 OECD countries and a higher effective tax rate than the OECD, G7 and G20.

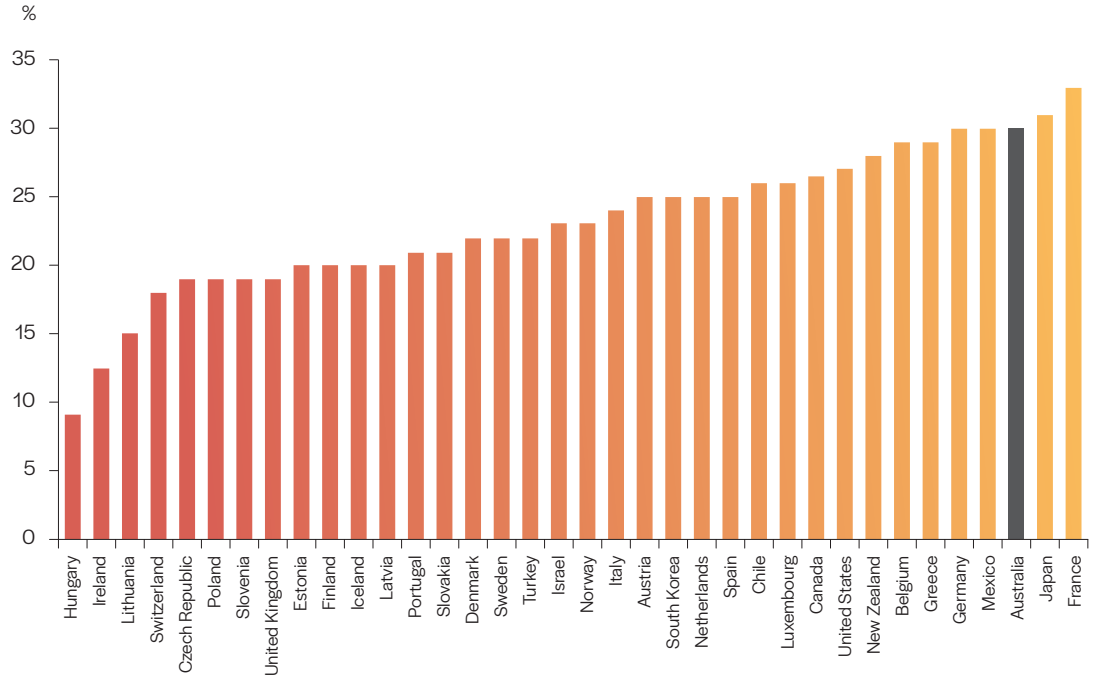
Long term investment

Mining projects involve high-risk exploration outlays, large upfront capital commitments, long-life assets, sophisticated technologies and long lead times to profitability. Competition for investment from other resource-rich economies is also intense.

Fuel tax credits

Fuel tax credits are critical to regional industries that depend on diesel, including mining, agriculture and tourism. Fuel tax credits ensure that fuel excise, as an effective road user charge, is not applied to off-road use of diesel and other fuels. Fuel tax credits also recognise the standard tax policy principle that business inputs should not be taxed.

Australia had the third highest company tax rate in the OECD in 2018



Source: KPMG, Corporate Tax Rate Table

$23.3b

Company tax and royalties

Paid by mining companies in 2016-17.

Source: Deloitte Access Economics

17%

Share of company tax

Paid by the mining industry in 2016-17.

Source: Deloitte Access Economics; ABS Cat. no. 5506

$115b

Company tax

Paid by mining companies over the last 12 years.

Source: Deloitte Access Economics

3rd

Highest in the OECD

Third highest company tax rate in the OECD in 2018.

Source: KPMG

POLICY PRIORITIES

- **Maintain Australia's long standing, equitable approach to credit off-road fuel excise**
- **Reduce company tax to an internationally competitive level**
- **Australia's tax integrity and debt deduction rules should be consistent with OECD measures**
- **Extend the Fringe Benefits Tax for remote communities to all rental accommodation for residential workforces for simplicity and fairness.**

AUTONOMOUS DRILLING

Major mining companies are deploying autonomous drill systems at mine operations. An autonomous drill rig can be controlled by a sole operator a thousand kilometres away at a remote operations centre without loss of precision. This makes for a safer work environment for employees. Autonomous drills also capture real-time information on rock characteristics, for example, which can allow the drill path to be adjusted in real-time.

ENERGY AND CLIMATE CHANGE

Australia has moved from having some of the lowest to some of the highest energy costs in the developed world. Pragmatic policy is needed to restore reliable and affordable energy for Australian businesses and households.

Reliable, affordable energy

Reliable, affordable and clean energy is central to Australia's economy and the living standards of all Australians. Over the past decade, Australia has moved from having some of the lowest to some of the highest energy costs in the developed world.

Global competition

To be competitive, Australian manufacturing, minerals processing and other energy-intensive activities need a simple, pragmatic energy and climate policy that can reduce power prices and emissions as well as improve network reliability.

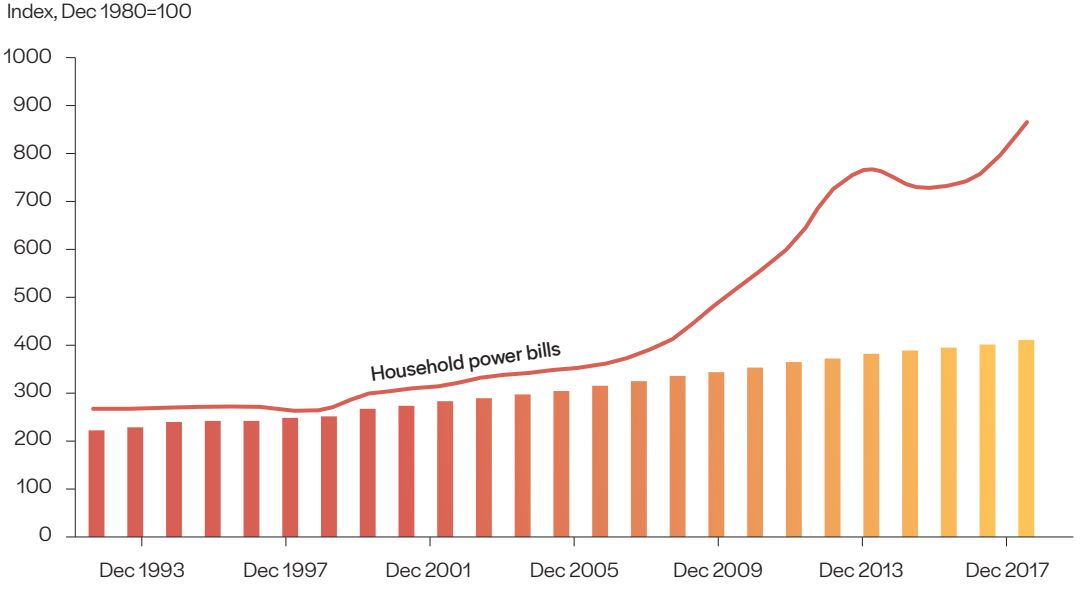
Technology neutral

A genuinely technology neutral approach should be adopted towards all low emissions energy sources. High Efficiency, Low Emissions (HELE) coal technologies and nuclear energy should be considered for Australia's energy needs.

Global responsibility

The MCA supports the Paris agreement as offering the best way to address what is a major global problem. Australia's commitment of 26-28 per cent reduction in greenhouse emissions by 2030 is appropriate.

Household power bills have increased five times faster than CPI



Source: ABS Cat. no. 6401

POLICY PRIORITIES

- **Drive efficient investment in additional generation assets capable of supporting the competitiveness of Australia's energy-dependent and trade-exposed industries**
- **A genuinely technology neutral approach to energy policy**
- **Continue the Emissions Reduction Fund and Safeguards Mechanism**
- **Access to international offsets as a least cost approach to abatement, which have associated environmental benefits such as reducing deforestation.**

SOLAR POWER

Solar energy is increasingly powering Australia's remote mining operations. In 2015, Rio Tinto built the Weipa Solar Plant to power its bauxite mine and processing facilities on the Western Cape York Peninsula in Queensland. The first of its kind, electricity generated by Weipa Solar offsets up to 600,000 litres of diesel usage each year.

110%

Power price increase

Household electricity prices over the last decade.

Source: ABS Cat. no. 6401

14%

Mining power use

Mining industry share of Australia's electricity use.

Source: Department of the Environment and Energy

20-40%

Emissions reduction

CO_2 emissions reduction through deployment of HELE.

Source: IEA Clean Coal Centre

8,000MW

Retiring baseload

Baseload electricity capacity scheduled to retire by 2030.

Source: MCA estimate

FREE TRADE AND INVESTMENT

Free trade agreements maximise opportunities for the Australian minerals industry to boost export income, attract investment and create high-value jobs.

For the past 40 years foreign capital has filled the mining investment gap, averaging 4 per cent of GDP.

More jobs for Australians

Australia's openness to trade and investment drives job creation with one in five Australian jobs in trade-related organisations. Exporting companies on average have workforces 23.8 per cent larger than non-exporting companies and pay 11.5 per cent higher wages.

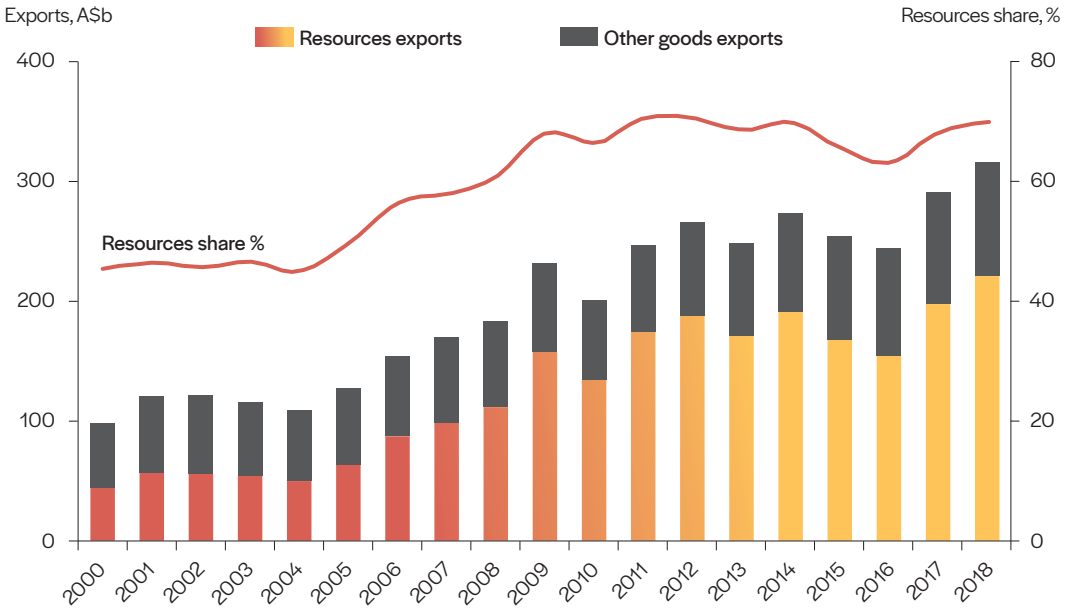
Households are better off

Trade and trade agreements reduce prices of consumer goods, increase income and improve living standards, especially for low and middle-income earners. A study by the Centre for International Economics has shown that trade liberalisation policies adopted from 1986 to 2016 have boosted real GDP by 5.4 per cent and increased the average family household's real income by $8,448 a year.

Economic benefits

Australia's free trade agreements have delivered significant benefits. Since signing the China-Australia Free Trade Agreement, Australia's merchandise exports to China have grown from $75.7 billion in 2015 to $100 billion in 2017. Services exports to China have also grown from $10 billion in 2014-15 to $14.7 billion in 2016-17.

Resources share of Australia's goods exports has increased



Source: ABS Cat. no. 5368

Courtesy of BHP

POLICY PRIORITIES

- **Strengthen public support and understanding of the economic benefits of free trade**
- **Pursue more free trade agreements with a focus on emerging economies in South East Asia**
- **Ensure domestic policy and regulatory settings support Australia's attractiveness as a destination for foreign investment**
- **Promote Australia globally as a preferred investment destination.**

$221b

Export value

Value of Australia's resources exports in 2017-18.

Source: ABS Cat. no. 5368

55%

Share of export revenue

Resources share of total export revenue.

Source: ABS Cat. no. 5368

700k

Jobs for Australians

People working for foreign-owned companies in Australia.

Source: Commonwealth of Australia, *Foreign Policy White Paper 2017*

77%

Share of iron ore revenue

Benefiting Australian suppliers, workers and governments.

Source: Port Jackson Partners

REAL-TIME SHIPPING

Mining companies are increasingly relying on real-time tracking of cargo vessels to make better decisions about optimal loading dates, customer patterns, market changes and weather conditions. By using data from across the supply chain, mine operators can adjust product volumes in response to shifts in demand.

WORLD DEMAND FOR AUSTRALIA'S RESOURCES

Population growth, urbanisation and the emerging demand for tech metals to power the technologies of tomorrow mean unprecedented demand for Australia's minerals.

Population growth

World consumption of mineral and energy commodities has increased substantially in the 21st century. Continuing urbanisation in Asia will see hundreds of millions of people moving to cities over the next 15 years. This will ensure robust demand for Australian minerals.

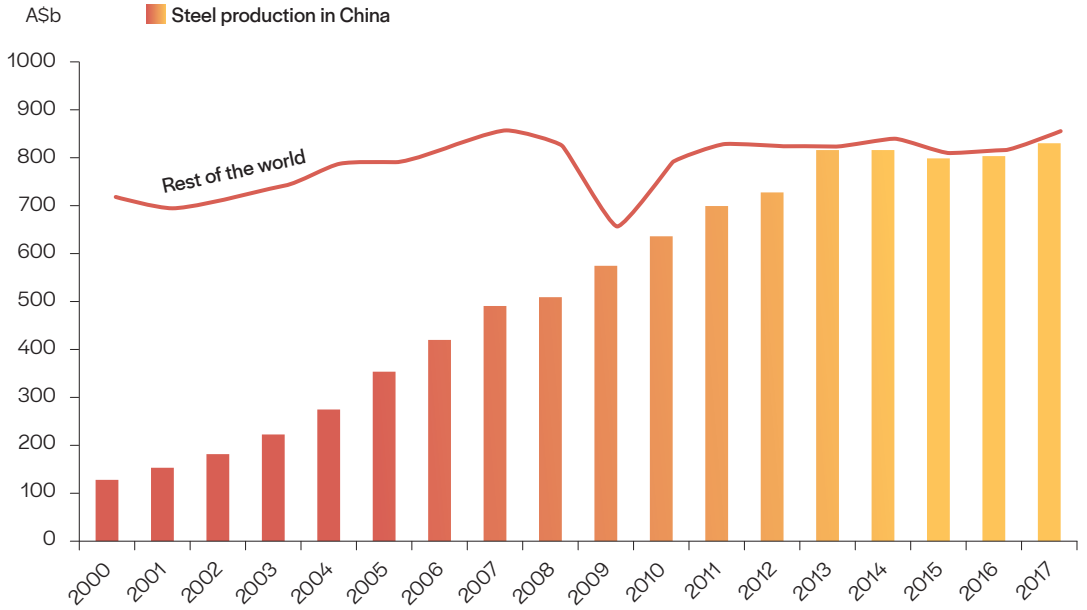
Mining for a modern world

Australia's iron ore and coal exports are used in the manufacture of steel used in construction, transport infrastructure and wind turbines. Exports of copper and gold are now being joined by the array of rare earths and high performance metals, such as lithium and cobalt, as the building blocks of the modern world.

One Belt, One Road

China's One Belt, One Road initiative will support this economic growth and stimulate future demand for mineral resources. Australia builds on a strong and healthy trading partnership with Asia. Significant reserves will be required to fuel its growth.

China has driven world steel production since 2000



Source: World Steel Association

POLICY PRIORITIES

- **Support minerals producers equally and not offer special treatment to any particular commodity based on current market perceptions**
- **Promote the broad economic and community contributions the mining industry makes to Australia**
- **Leverage the strong demand for strategic minerals to develop partnerships with customers to drive investment.**

AUTONOMOUS TRAINS

Rio Tinto successfully deployed the world's first automated heavy-haul, long distance rail network in 2018. Since its first loaded delivery – three locomotives carrying 28,000 tonnes of iron ore in July 2018 – more than one million kilometres of safe, controlled autonomous journeys have been travelled. The autonomous trains are remotely monitored by operators at Rio Tinto's Operations Centre in Perth. The trains have an average return distance of about 800 kilometres with the average journey, load, dump and return cycle about 40 hours.

99%

World steel production

Increase since 2000.

Source: World Steel Association

57%

World copper consumption

Increase since 2000.

Source: Department of Industry, Innovation and Science

137%

World aluminium consumption

Increase since 2000.

Source: Department of Industry, Innovation and Science

52%

World zinc consumption

Increase since 2000.

Source: Department of Industry, Innovation and Science

AUSTRALIA'S ENERGY EXPORT OPPORTUNITIES

Australia's close proximity to Asia makes the country well-placed to supply energy commodities to the emerging and highly populated economies that are driving growth in world energy demand.

Asia drives demand for energy

World primary energy demand has increased 44 per cent since 2000. While OECD energy consumption increased just 3.45 per cent, energy consumption in non-OECD countries has doubled. Almost 65 per cent of the growth in world energy consumption is attributable to China.

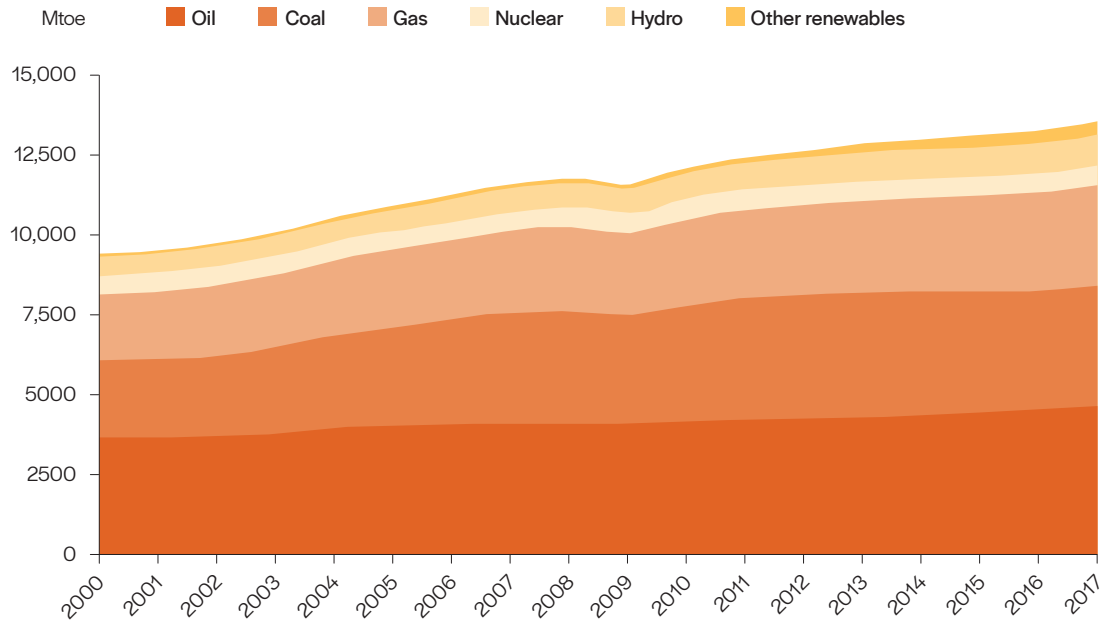
Australian coal powers the world

Australian coal has helped lift hundreds of millions of people in Asia out of poverty over recent decades. This growth will continue with the International Energy Agency forecasting that Australian coal exports will grow 37 per cent by 2040. High quality Australian coal is reducing carbon emissions in these markets through its use in modern high efficiency, low emissions power plants.

Untapped potential of uranium

Despite hosting the world's largest uranium resources – three times more than Canada – Australia supplies little more than 10 per cent of the global market. Nuclear energy is projected to grow by between 41 and 88 per cent by 2040, according to the IEA. This represents a substantial opportunity for Australian producers.

World energy demand by type generation since 2000



Source: BP Statistics

44%

World energy demand

Increase since 2000.

Source: BP Statistics

38%

Electricity from coal

Coal share of world electricity generation in 2017.

Source: IEA, *World Energy Outlook 2018*

84%

Energy demand in Asia

Forecast growth in electricity demand in Asia-Pacific by 2040.

Source: IEA, *World Energy Outlook 2018*

0

Nuclear CO_2 emissions

Nuclear power is a zero carbon emission fuel source.

Source: World Nuclear Association

POLICY PRIORITIES

- **Promote Australian coal and uranium producers to international customer countries as reliable suppliers of energy**
- **Advocate free trade agreements that allow full access for Australia's energy resources in international markets**
- **Support the development of carbon capture and storage as a means of delivering global carbon emission reductions.**

AUTONOMOUS TRUCKS

Fully autonomous driverless haulage trucks operate at a number of mine sites in Australia. Remote operated, the trucks respond to GPS directions. Rio Tinto pioneered the use of autonomous haulage technology and today operates the largest autonomous fleet in the world. Benefits include improved employee safety, fewer on-site incidents and reduced fuel consumption and emissions. Rio Tinto's automated fleet has delivered a 14 per cent improvement in productivity and a 13 per cent reduction in load and haul operating costs.

The Minerals Council of Australia supports the **UN Sustainable Development Goals**

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